Las Vegas, Nevada Hotel Casino

4.9 MW reciprocating CHP system

Project Profile

combined heat & power in a Las Vegas casino

Quick Facts

Location:
Las Vegas, Nevada, Clark County

Capacity:
4.9 MW (six overhauled 817 kW Caterpillar 3516 reciprocating engines)

Fuel: Natural gas

CHP system: Hot water

Energy Efficiency:
Approx. 75% overall thermal efficiency is expected

Construction Time:
12 months

System Online: May 2004

Total Project Cost:
Approximately $7,500,000

Energy Cost Savings:
Estimated $1,500,000/year

Expected Payback Time:
5 years

Funding Sources:
No incentives from local, state or federal sources. All costs were paid by the casino/hotel.

Project Overview

This Las Vegas, Nevada hotel/casino project is one of the first casino CHP projects to be implemented in the U.S. The project was implemented at one branch of a major hotel chain (who wishes to remain anonymous).

A company-wide analysis for the hotel chain has shown that the group spends almost $60 million a year in gas and electricity across 18 major properties. The company has found that lighting, heating and cooling requirements constitute the vast part of these costs.

This first CHP system operating at a Las Vegas casino, with 4.9 MW of capacity, went online May 1, 2004 after only a year of construction. Four of the six overhauled Caterpillar 3516 natural gas fired reciprocating engines are located at the back of the casino complex. The other two engines are located under the casino's multi-media sign to provide electricity for the sign.

The CHP system is designed to deliver 180 ^{o}F - 200^{o}F hot water for domestic hot water and for space heating needs during the winter months.

The CHP system is designed to serve the energy needs of the hotel. The convention center was not included due to the sporadic nature of its electricity demand. The total electricity peak demand of the facility is about 11 MW. Although the system could potentially sell power back to the grid, Nevada Power has required the casino to buy at least 200 kW from the grid at all times. The system was set up to run 24 hours a day and serves the base load electrical demand. Approximately 50% of the annual electricity needs are served by the 4.9 MW CHP system, and it is expected to achieve an average overall thermal efficiency of about 75%.

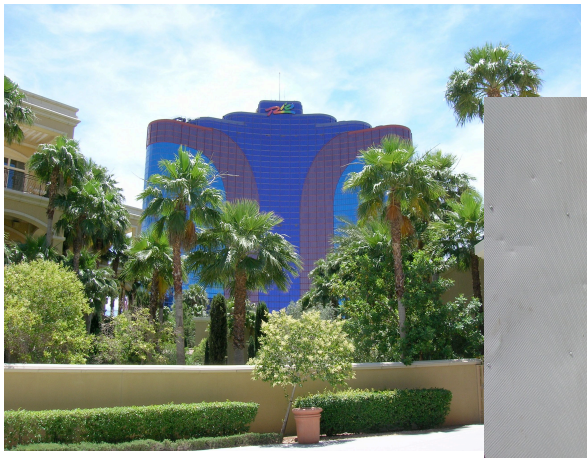
The casino/hotel management considered installing absorption chillers as part of the project, but decided to keep initial costs down and delayed installation of an absorption chiller system. This would have decreased energy bills further but would have added significantly to the initial capital cost of the project, and likely would have extended the project payback time.

Costs & Financial Incentives

The entire project cost of $7,500,000 was covered by the hotel chain. The company received no incentives from local, state, or federal sources. The system economics are affected by the decision to not (at least initially) install an absorption chilling system as this reduced the initial capital cost but also necessitates "dumping" heat during the hot summer months, lowering the overall system efficiency.

Emissions

All six Caterpillar units are equipped with exhaust gas recirculation (EGR) systems to reduce oxides of nitrogen (NO_X) emissions, and tests have measured NO_X emission levels of 1.7ppm. Clark County is in serious non-attainment for PM_{10} (Particular Matter smaller than 10μ meter = 10^{-6} meter) and serious non-attainment for carbon monoxide. Therefore all units must obtain air emissions permits and all new DG sites must meet a 'Best Available Control Technology (BACT)' standard. There are thresholds in place that trigger additional permitting activities if pollutant emissions exceed a 'major threshold.'



The picture on the left shows the exterior of the hotel and casino.

Pictured above: One of the six refurbished Caterpillar reciprocating engines. The engines require an oil change every 1,000 hours and demonstrate an availability of 94% to 98% (on a monthly basis).

The picture to the left shows parts of the 3,500-gallon hot water loop that serves the hotel's hot water needs.

If the "macrogrid" fails, the casino's CHP system and backup generators are able to satisfy the facility's most important electricity, cooling, and hot water demands.

The casino is still functional in such an event.

Further information can be found at

Nevada State Office of Energy: http://energy.state.nv.us
Regulatory Requirements Database for Small Electric Generators (e.g. emissions): http://www.eea-inc.com/rrdb/DGRegProject/index.html
PRAC: www.chpcenterpr.org

Version 1.2 12/19/06

Contact Information

Tim Lipman
Pacific Region CHP Application Center, Energy and Resources Group, UC Berkeley
2105 Bancroft Way, 3rd Floor
Berkeley, CA 94720-3830
Tel: (510) 642-4501
Email: telipman@berkeley.edu